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May 12, 1992

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PM-1522

Dear Mr. Smith:

Thank you for your letter of May 11, 1992 regarding PM-1522. I have reviewed your comments and offer the following remarks for your consideration.

The relationship between tobacco OV, tobacco post-vent temperature, and tobacco stability (i.e., the length of time the impregnated tobacco may be stored after depressurization before the final expansion step and still be satisfactory expanded) (p. 9, lines 4-13), is an important element of PM-1522. The specification of PM-1522 teaches how to control tobacco stability through control of tobacco post-vent temperature.

Condensation of a controlled amount of carbon dioxide on the tobacco prior to the depressurization step is taught in PM-1522 as the means of achieving the desired

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tobacco post-vent temperature. Depressurization alone ~~may~~ will not provide sufficient uniform cooling under certain process conditions. However, the additional cooling provided by the evaporation of the condensed carbon dioxide will provide the uniform extra cooling needed. Depending on the tobacco stability desired, the amount of cooling required by the evaporation of the condensed carbon dioxide may be very small. Claim 13 sets forth a lower limit of "a negligible amount ... of carbon dioxide per pound of tobacco is condensed on the tobacco." Such a negligible amount would be evidenced by plotting the thermodynamic path of the impregnation on a temperature-entropy diagram and observing that the path is at some point below the saturation temperature of the carbon dioxide. Crossing the saturation line indicates that some carbon dioxide gas has condensed on the tobacco. The amount of condensation, however, may be too small to accurately quantify, hence the use of "negligible."

SPECIAL CASE FOR A PARTICULAR TOB/CO_2 MASS RATIO AND SMALL TOB MASS RATIO TO ATTAIN UNIFORM POST VENT TEMP.

The specification links the tobacco post-vent temperature to the degree of tobacco stability required (p. 12, line 34 to p. 13, line 5). Although the specification explicitly states that the desired tobacco post-vent temperature is "from about -35°F to about 20°F" (p. 14, line 35; p. 25, line 12), it is believed that a tobacco post-vent TEMP.

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in the range of "from about -35°F to about 30°F" (claim 1) is supported by the teachings of the specification.

For example, Figure 13 could be re-drawn with a stability line representing a tobacco post-vent hold time of 2 minutes, rather than about 1 hour. Such a change in the desired stability would allow an increase in the tobacco post-vent temperature. Similarly, Figure 13 could be re-drawn for an impregnation carried out at a pressure other than 800 psig. Again, the tobacco post-temperature required to achieve the desired stability would change (see p. 14, lines 6-33). In addition, claim 1 does not contain a limit on tobacco OV content. As is clear from the specification, as tobacco OV decreases, the tobacco post-vent temperature required to achieve a desired level of stability ~~also decreases~~ INCREASES (see Figure 13).

With respect to your comments regarding U.S. Patent 4,235,250, that patent states that the tobacco-carbon dioxide system is cooled "to a temperature close to the saturation temperature of carbon dioxide but not lower than -23°C" (col. 4, lines 43-45). Thus, the '250 patent teaches that carbon dioxide should not be condensed on the tobacco prior to the depressurization step. (See col. 4, lines 51-56). This is an important distinction from the invention of

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PM-1522 which teaches condensation prior to depressurization. Condensation of carbon dioxide on the tobacco prior to depressurization results in a tobacco with a uniform post-vent temperature profile (see Figure 10), and thus, a more uniform expanded product.

Finally, I am somewhat confused regarding your comments about the impregnation pressure range set forth in the claims of PM-1522. Claim 1 sets forth a carbon dioxide pressure range of "from about 400 psig to about 1057 psig." This pressure range is broader than the pressure range you suggest.

Very truly yours,

William J. McCabe

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